1.1 E ✓ and H ✓

1.2 Same molecular formula (atoms) but a different ✓ structural formula (bonding).

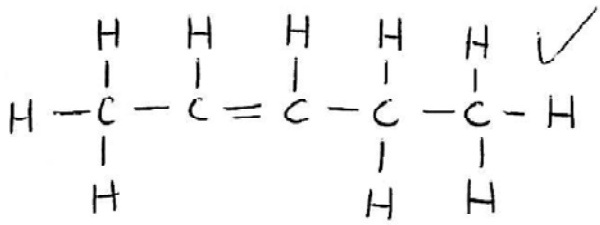
1.3 A or E or H ✓

1.4 Contains the maximum number of hydrogen atoms for the number of carbons present. ✓

1.5 —OH ✓

1.6 esters ✓

1.7 1-fluoropropane ✓

1.8  ✓

1.9 I ✓ Carboxylic acids are held together by hydrogen bonding intermolecular forces which are stronger than the vdW forces between alkane molecules. Stronger IMF, more energy to break, ↑ bp.

.10 $CH_3CH_2CH_2F + H_2O$ ✓ $\longrightarrow CH_3CH_2CH_2OH + HF$ ✓

.11 $C_5H_{12} + 8O_2$ ✓ $\longrightarrow 5CO_2 + 6H_2O$ ✓

.12 $0,58\ g \cdot cm^{-3}$ ✓

.13 $0,7\ g \cdot cm^{-3}$ ✓

.14 The more carbon atoms in the chain (molecule), the higher the density of the compound. Directly proportional relationship. ✓✓

2.1 addition rxn (or halogenation or bromination) ✓

2.2 $CH_3CH(CH_3)CH=CHCH_2CH_3 + Br_2$ ✓ ✓

$\longrightarrow CH_3CH(CH_3)CHBrCHBrCH_2CH_3$ ✓

2.3 Reaction rate will increase as temperature increases (or other suitable hypothesis). ✓

2.4 temperature ✓

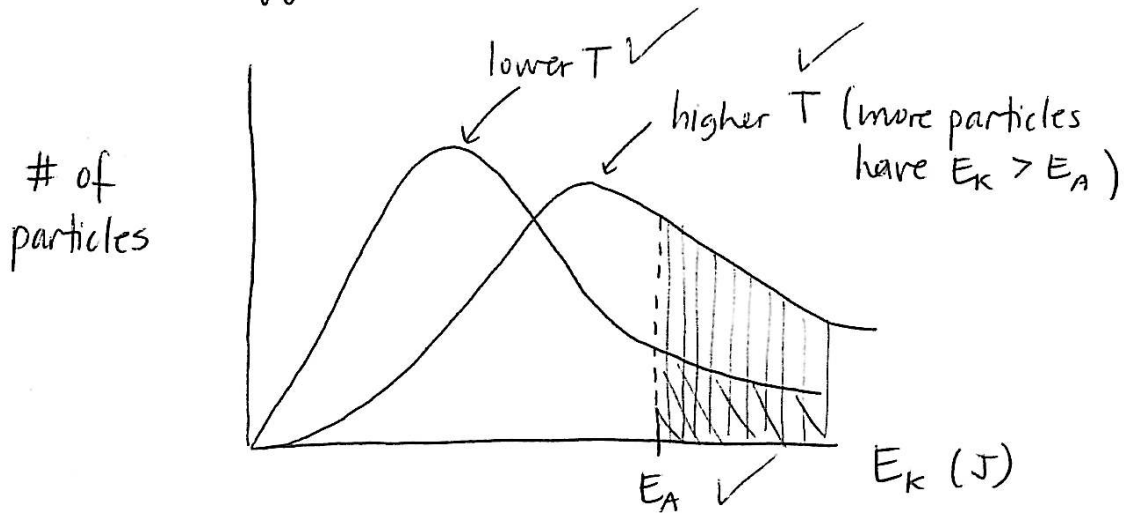
2.5 reaction rate ✓

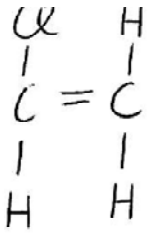
2.6 initial concentration of reactants ✓

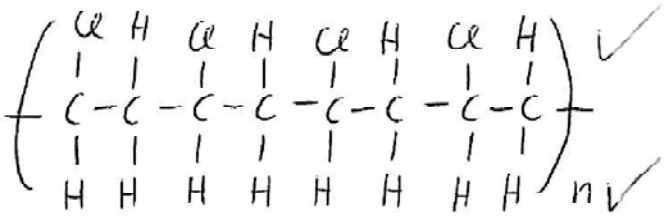
2.7 Reaction rate increases as temperature increases. ✓

2.8 At higher temperatures, reactant molecules move at greater speeds and have more E_K. ✓ A greater proportion of collisions have sufficient energy to overcome the activation energy ✓ (ie. a greater proportion of collisions are effective collisions).

2.9

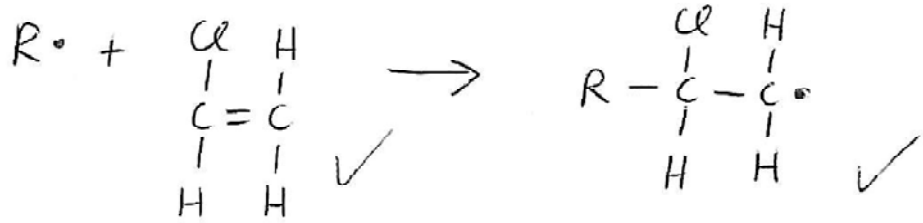


3.1  ✓

3.2  ✓ ✓

3.3 initiation ✓
propagation ✓
termination ✓

3.4 A free radical ✓ reacts with a monomer, breaking its double bond and creating a new free radical.

3.5  ✓ ✓

3.6 propagation ✓

3.7 Any 2 advantages ✓✓

eg. strong
light
can be recycled
chemically inert

Any 2 disadvantages ✓✓

eg. not biodegradable ∴ consume landfill space
made from non renewable petroleum
may catch fire easily
give out poisonous fumes when burned

3.8 electrolysis - The decomposition of a substance (or production of a desired compound) by the addition of electrical energy

brine - Aqueous solution of NaCl

3.9 Cl_2 - disinfectants, pesticides, bleaching cloth & paper...

NaOH - extraction of Al, making rayon, making dyes...

H_2 - hydrogenation (margarine), making ammonia (Haber)...

3.10 anode

oxidation

3.11 $2Cl^-(aq) \longrightarrow Cl_2(g) + 2e^-$

3.12 $2H_2O(l) + 2e^- \longrightarrow H_2(g) + 2OH^-(aq)$

3.13 Allows positive ions to pass through.

3.14 diaphragm cell - asbestos causes health problems including lung cancer and other lung diseases

mercury cell - products can be contaminated by mercury, an environmental pollutant and poison

3.15 $Cl_2(g)$ and $H_2(g)$ react explosively

4.1 Allows the flow/movement of ions.

4.2 car batteries

4.3 secondary cells - they are rechargeable ∴ each battery can be used for a longer period of time ∴ less waste including pollutants such as lead and acid

4.4 $K_c = \frac{[SO_3]^2}{[SO_2]^2[O_2]}$ ✓✓

4.5 increase temperature ✓
add a catalyst ✓
increase pressure ✓

4.6 advantages – saves time, more product produced per day, others? ✓✓
disadvantages – safety factors (explosion risk), others? ✓✓

4.7 increased pressure ✓

5-1 substitution rxn ✓

5-2 see graph

5-3 Reaction rate decreases over time. ✓

5-4 As time passes reactants are used up, leading to a lower concentration therefore fewer collisions occur therefore rxn rate decreases.

5-5 What effect does a catalyst have on rxn rate? ✓

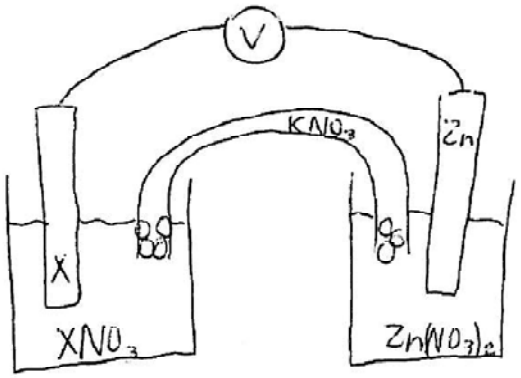
5-6 reaction rate ✓

5-7 temperature ✓
initial concentration of reactant ✓

5-8, 5-9 graph

5-10 A catalyst lowers E_A thus a greater proportion of collisions are effective collisions. ✓

6.1



✓ labelled
✓ X in XNO_3
✓ Zn in $Zn(NO_3)_2$
✓ salt bridge
✓ voltmeter
✓ cotton balls

6.2 concentration of solutions = 1 mol·dm^{-3} ✓
temp = 298K ✓

6.3 $E^\circ_{cell} = E^\circ_{cat} - E^\circ_{an}$ Zn loses mass ∴ $Zn \rightarrow Zn^{2+} + 2e^-$
∴ Zn is anode ✓

$E^\circ_{cat} = E^\circ_{cell} + E^\circ_{an}$ ✓
$= 1,56 + (-0,76)$
$= 0,80V$ ✓

6.4 silver / Ag ✓

6.5 $Ag^+(aq) + e^- \longrightarrow Ag(s)$ ✓

6.6 zinc / Zn ✓

6.7 As the concentration of reactant ions decreases, E°_{cell} decreases. ✓

6.8 Increase the surface area ✓ of the electrodes, this leads to a greater reaction ✓ rate ∴ more electrons transferred per second. ✓

Also accept increase concentrations or decrease spacing between electrodes, as long as explanations are correct.

7.1 1 hour = 60 min = 3600 s ✓

1 Amp-hour = 3600 Amp-seconds = 3600 C

Values : 180 000 ✓
396 000 ✓
180 000
396 000

7.2 energy stored = $W = VQ$ ✓

A 900 kJ ✓
B 1980 kJ ✓
C 2160 kJ ✓
D 4752 kJ ✓

7.3 Cell D ✓

7.4 Dry cells have a solid / paste ✓ electrolyte rather than a liquid ∴ less chance of mess or leakage. ✓

7.5 eg. torch, cell phone, lap top, camera, portable radio ✓✓

7.6 2 positives ✓✓

eg. – allows for portable items and technology
– rechargeable varieties reduce waste & pollution
– quiet, reliable source of power
– can be low cost, easy to use, widely available

2 negatives ✓✓

eg. – disposables lead to solid waste & pollution
– may heat up, leak, even explode
– can be expensive
– may have short life spans and low power output

7.7 $Cd \rightarrow Cd^{2+} + 2e^-$ ✓

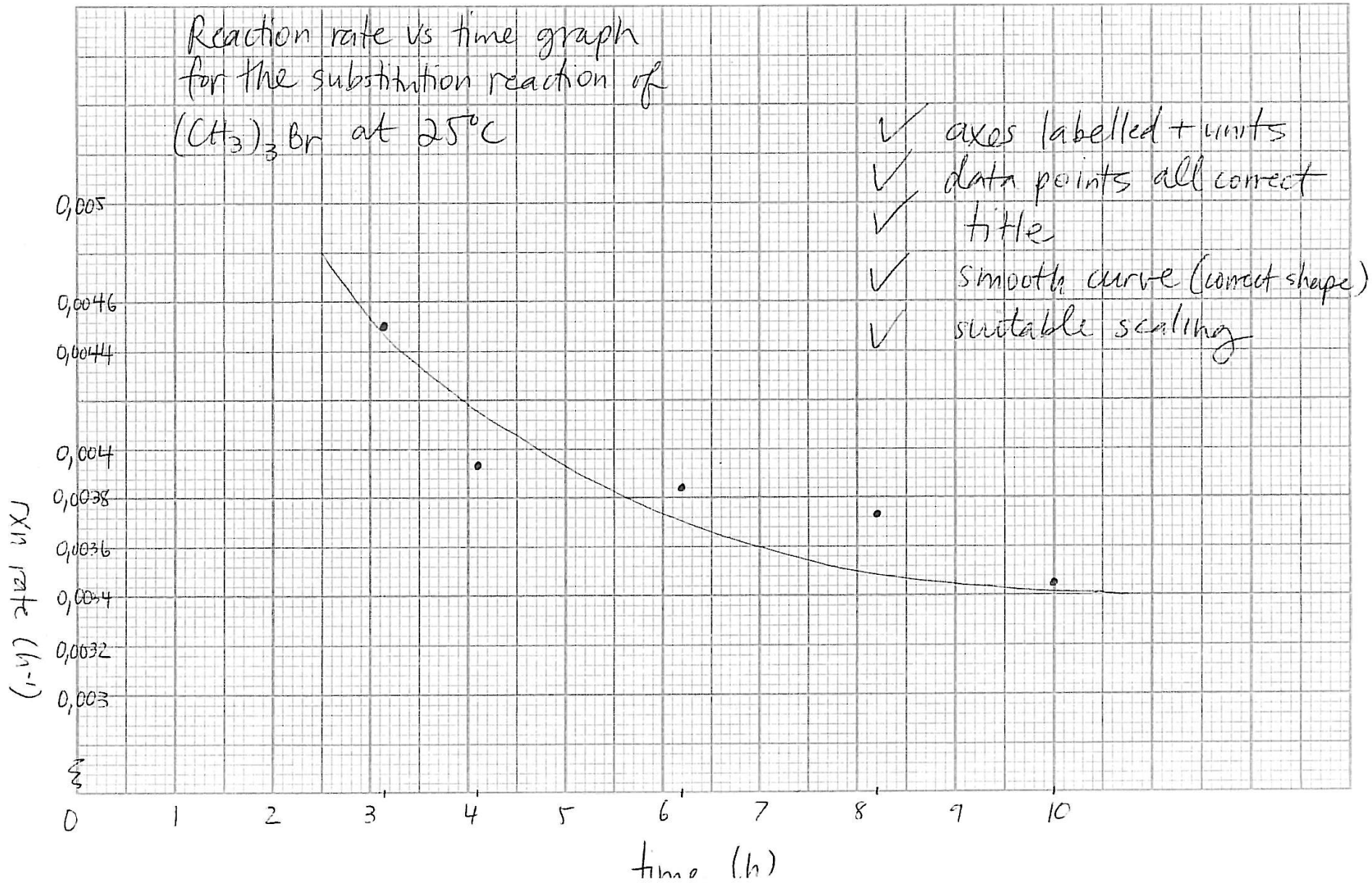
$Ni^{2+} + 2e^- \rightarrow Ni$ ✓

7.8 $E^\circ_{cell} = E^\circ_{cat} - E^\circ_{an}$

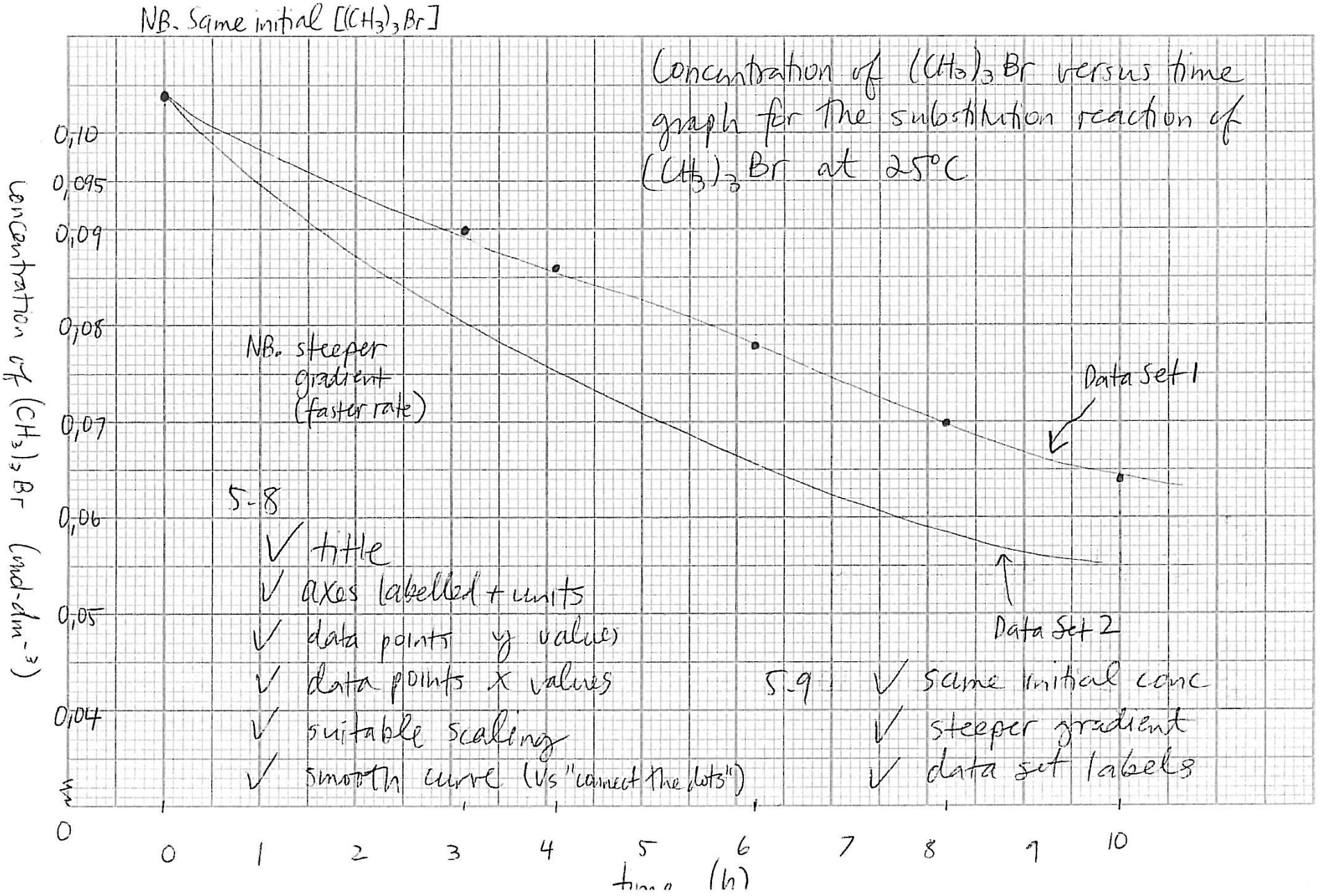
$= -0,25 - (-0,40)$

$= +0,15\ V$ ✓

NB. 7.7 & 7.8 are not accurate for real NiCad batteries


Reaction rate vs time graph for the substitution reaction of $(CH_3)_3Br$ at 25°C
✓ axes labelled + units
✓ data points all correct
✓ title
✓ smooth curve (correct shape)
✓ suitable scaling
0,005
0,0046
0,0044
0,004
0,0038
0,0036
0,0034
0,0032
0,003
rate (h⁻¹)
0 1 2 3 4 5 6 7 8 9 10
time (h)

5-8
5-9


NB. Same initial [(CH3)3Br]
Concentration of (CH3)3Br versus time graph for the substitution reaction of (CH3)3Br at 25°C
0,10
0,095
0,09
0,08
0,07
0,06
0,05
0,04
0
0 1 2 3 4 5 6 7 8 9 10
time (h)
Concentration of (CH3)3Br (mol-dm-3)
NB. steeper gradient (faster rate)
Data Set 1
Data Set 2
5-8
✓ title
✓ axes labelled + units
✓ data points y values
✓ data points x values
✓ suitable scaling
✓ smooth curve (Vs "connect the dots")
5-9
✓ same initial conc
✓ steeper gradient
✓ data set labels